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The Impact of Investments in Agricultural Higher Education

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This issue of A.I.D. Evaluation Highlight's provides A.I.D. management with a short summary of the findings, lessons, aid issues identified in the CDIE evaluation series on agricultural higher education. The study began in 1985 and included field visits to 23 agricultural universities and faculties in 10 countries (India, Indonesia, Thailand, Brazil, Mexico, the Dominican Republic, Ethiopia, Morocco, Malawi, and Nigeria).

### SUMMARY

Since 1952 the United States has provided assistance in the development of agricultural universities and faculties in 40 developing countries. Most of this assistance has been provided through a partnership with U.S. land-grant universities, which served as the primary contracting agents for providing technical assistance. Large numbers of U.S. faculty were sent on long-term overseas assignments to the host-country universities to assist in establishing and improving education and research programs. Similarly, thousands of host-country faculty were sent to U.S. universities for advanced degree training in the agricultural sciences.

The investments made in these developing countries' universities have yielded high returns. Most of the U.S.-trained host-country faculty returned to their home universities and emerged as the primary leaders in expanding and moving their institutions to a position of educational prominence. Their undergraduate programs have greatly expanded the supply of trained agriculturalists, and many institutions are now able to support training at the graduate level. In addition, many of these universities have led the research and development of new production technologies for the agricultural sector.

Despite their past accomplishments, the future growth of many of these universities likely will be constrained by declining budgetary sources, faculty "inbreeding," excessive government regulation, and a lack of access to state-of-the-art advances in international science and education. To maintain the universities' leadership in research and education, new forms of international collaboration are needed to address larger issues of renewing and sustaining university vitality.

## BACKGROUND

Before World War II, few resources were invested in developing institutions of agricultural higher education in the developing world. As a consequence, in the post-World War II era most developing countries faced a severe shortage of agricultural technicians and scientists to support public- and private-sector development efforts for rural growth. In many countries, senior- and middle-level positions either remained under the control of expatriate staff or were assumed by underskilled host-country nationals.

Shortages in skilled manpower were particularly acute in agricultural research and extension. There were some outstanding institutions, heavily staffed by expatriates, undertaking research on export commodities (such as rubber, tea, and coffee), but the colonial governments had allocated few resources or developed little manpower for research in basic food staples.

The new developing countries were intent on expanding research and extension services to agricultural producers. However, the lack of trained manpower seriously hampered the development and application of new agricultural technologies. Donors and host governments alike soon recognized that in-country institutions of higher education would need to be strengthened, if not created anew, to address this problem.

## A.I.D.'s ASSISTANCE APPROACH

A.I.D.'s strategy of building new agricultural universities and faculties throughout the developing world is an element of the A.I.D. approach to enhancing Third World agricultural manpower and research capabilities. In addition to technical assistance, A.I.D. funds frequently have been provided for campus construction, laboratory equipment, and library material. A key feature of the strategy has been to enlist the support of the U.S. land-grant universities as the primary source of technical assistance. Thus, over the past several decades nearly every major land-grant university has been under contract with A.I.D. at one time or another in supporting this activity.

The primary contracting mode has been to "twin," or pair in a partnership, one U.S. land-grant university with a sister host-country university (table 1). The U.S. university sends a number of its faculty to the host-country university on short- and long-term assignments to assist in developing the curriculum and research programs. In turn, young faculty from the host-country university are sent to the U.S. university for advanced degree training.

The number of U.S. university advisers and developing-country trainees involved in this institution-building effort has varied considerably. At any one time a U.S. university might have a dozen or more of its faculty members on assignment in the host country and perhaps 20 or 30 advanced degree candidates from the host university studying at the U.S. university.

The largest university development programs have been undertaken in India, Brazil, Nigeria, and Indonesia. In India, six U.S. universities were involved in developing nine agricultural universities. More than 300 U.S. faculty have worked in this effort, and 1,018 Indian faculty have been sent to the United States for advanced training. In many cases, the A.I.D. efforts have involved setting up entire new universities or faculties. In these early stages, U.S. advisers frequently had to do most of the teaching as well as occupy major management positions until host-country nationals returned from their overseas training to assume these responsibilities.

Many of the early contracts for university development were of short duration (3 to 5 years). In subsequent years A.I.D. lengthened the timeframe (Indonesia, 30 years; India, 15 years; Morocco, 20 years). Even after contracts have ended, some countries continued to finance faculty training at the former contracting U.S. universities.

The limited timeframes of many of the projects did not allow much emphasis beyond developing undergraduate degree programs. The longer term projects generally have included the development of graduate degree programs and the initiation of research programs.

## IMPACT

### Education

The agricultural universities and faculties assisted by A.I.D. generally have fulfilled their intended role, becoming major sources of trained manpower in the agricultural sciences. Sizable increases in the supply of agriculturalists, particularly at the undergraduate level, have been the most notable achievement.

At most of the universities, undergraduate enrollment and faculty numbers have grown rapidly. Some have become multicampus institutions with a wide variety of degree programs. The Bandung Institute of Agriculture (Indonesia) has 9,000 students and projects an enrollment of 20,000 by the end of the century. The Institute of Agronomic and Veterinary Sciences (Morocco) has 2,550 students. Other institutions, such as the Bunda College of Agriculture (Malawi) with 367 students, the Superior Institute of Agriculture (Dominican Republic, with 314 students, and Alemaya Agricultural University (Ethiopia) with 1,173

students, are still quite small.

Most of the new agricultural universities have had no difficulty attracting talented students; generally, however, few women have been enrolled, even though in the rural sector many farming functions are performed by women. Female enrollment has been growing in a few institutions, such as the University of Agricultural Sciences in Bangalore, India, where half of the student body in the agricultural college are women.

In general, the major fields of training have been in the crop and animal sciences. Training in the social sciences has not been a strong program element in some universities. A few universities have introduced training programs in fisheries, forestry, and natural resource and environmental management. Some universities are designing new undergraduate programs in agribusiness.

A number of universities have been quite innovative in designing "learn-by-doing" undergraduate curricula. Andhra Pradesh Agricultural University in India requires students to live and work in a rural village for 5 to 6 months, whereas students at the Institute of Agriculture and Veterinary Medicine in Morocco must progress through a sequence of increasingly more difficult field training exercises in order to acquire a thorough understanding of the realities of Moroccan agriculture. In general, however, at many universities pedagogic technologies tend to be relatively outdated and inefficient, with few instructional aids and relying primarily on rote memory and the lecture method.

Many universities have gone on to create their own programs for agricultural training at the graduate level. However, many countries are still dependent on foreign training for much of their advanced degree work. This is particularly the case for smaller countries, such as those in Africa, where fragile national economies are not able to support a wide array of graduate programs.

## RESEARCH AND EXTENSION

The impact of the developing countries' universities in agricultural research and extension has been varied. Some of the larger universities, such as those in India, Indonesia, and Thailand, have been able to support significant levels of applied research. Their research capacity has been enhanced in part with the growth in numbers of faculty with Ph.D. degrees. Given their limited staff, smaller agricultural universities, such as those in Malawi, Ethiopia, and the Dominican Republic, have had a much more modest and limited research role.

Most major research efforts have focused on dcereals (wheat, rice, sorghum, millet, and maize). Universities frequently

have been at the forefront of major production gains in developing seed varieties, conducting adaptive trials, or refining cultivation and disease control practices.

A second area of significant impact has been in livestock research. In general, the quality of dairy herds and poultry and egg production have increased through university research in breeding, disease control, and feed improvement.

With some exceptions, research in horticulture and vegetable crops has been less prominent. Kasetsart University (Thailand) has actively supported a growing fruit export industry. The university has introduced tissue culture for rapid propagation and mutation breeding for several fruit crops. Alemaya University of Agriculture in Ethiopia has introduced a number of improvements in peppers, tomatoes, and potatoes.

A few universities have assumed major research and leadership roles in resource and environmental management. Thailand has adopted guidelines for watershed management developed by Kasetsart and has requested the university to develop a national parks and wildlife plan. The Bogor Agricultural Institute has a distinguished record of leadership in helping the Indonesian Government in legislative and policy initiatives for natural resource management.

Most of the universities have not been involved in significant extension roles, because government line agencies have tended to guard this function for themselves. An exception is India, where, in addition to having their own extension subject-matter specialists stationed in the field, the state agricultural universities train government extension agents.

#### International Training and Assistance

Some of the universities are assuming a leadership role in providing development assistance to other countries. A number of African agricultural scientists are being trained at the Institute of Agronomic and Veterinary Sciences, many on full scholarship from the Moroccan Government. In addition, faculty from the institute are providing technical assistance to Mauritania, Senegal, and Rwanda. The Postgraduate College at Chapingo, Mexico, is providing training to African agriculturalists. Kasetsart University has emerged as a major regional training center, with a number of international research programs located on its campus.

## FINDINGS

### Faculty Development

Most of the host-country faculty who receive U.S. training through the A.1-D. project funds return to their home universities to assume major leadership roles in teaching, research, and administration. Very few have been lost through internal or external "brain drain." Although the early generation of leaders is now retiring, their commitment and retention account for much of the growth and success of their universities.

In the last decade, opportunities for overseas study have declined, and, as a consequence, inbreeding has become a serious problem at many universities. In many cases, 80 to 90 percent of the new generation of faculty are employed by the same university from which they received their undergraduate and graduate training.

### Project Duration

University development projects that have been of longer duration have tended to be more successful. Project experience indicates that it takes 10 to 15 years to train a critical mass of host-country faculty, and then another decade to build a sufficient base of experience for conducting an effective research program.

Upon returning to their home countries after completing their U.S.-based training, young apprentice researchers and teachers particularly need a support network of more experienced senior personnel who can guide and support them in applying, new skills. U.S. advisers can provide much help in this early process of maturation, both in research topic selection and design and in curriculum and instructional techniques.

### Declining Financial Support

Despite past successes in a number of countries, current underfunding of agricultural universities and faculties is weakening research and educational programs. Funding for research is declining, library resources are becoming outdated, and laboratory equipment, instructional material, and transportation for field research are frequently unavailable. Faculty salaries have not kept pace with inflation, and many faculty are forced to seek income from part-time consultancies outside of their universities.

The problem of university financing is complex and is linked to a number of issues involving the absence of close ties to ministries of agriculture, the lack of institutional autonomy, and the relatively narrow focus of many universities on production agriculture.

### Linkages to Ministry of Agriculture

Forming close linkages with ministries of agriculture is

crucial to developing adequate funding and political support for universities. In India, the state governors serve as the vice chancellors for the 26 state agricultural universities, and most state departments of agriculture have close research and extension ties with the universities. The Indian Council for Agricultural Research, a national agency, also provides funds and program support to the universities.

In other countries, agricultural universities and faculties have not been able to develop a strong base of national support. Developing collaborative relationships with ministries of agriculture frequently is complicated by the fact that many agricultural universities and faculties are under ministries of education. With no authority over the universities, the ministries of agriculture have tended to create their own parallel research agencies, where they invest their scarce research funds and thereby deprive the universities of adequate research funding. For example, the agricultural university system in Thailand receives less than 3 percent of the total national budget devoted to agricultural research.

#### University Autonomy

Many agricultural universities and faculties are forced to operate within highly centralized structures, where national agencies control major as well as minor decisions concerning their curricula, program priorities, enrollments, and finances. This kind of overregulation has reduced many universities to passive and reactive institutions. In the absence of discretionary authority, university leaders tend to become preoccupied with addressing short-term, routine needs, thereby neglecting long-term planning.

In cases where there is sufficient institutional autonomy, some universities have been very entrepreneurial and innovative in developing programs to respond to the needs of their constituencies and in building coalitions of support for their research and education endeavors. The Superior Institute of Agriculture in the Dominican Republic, the Institute of Agronomic and Veterinary Sciences in Morocco, and the Postgraduate College in Chapingo, Mexico, all have exhibited considerable initiative and leadership in mobilizing additional financial support from national and international sources. The Moroccan institute now is taking the lead in organizing a consortium of universities to undertake international development projects.

#### Production Agriculture

Most of the agricultural research and outreach programs of the universities have focused on improvements in the biological and cultivation practices of crop and animal production. Less attention has been devoted to improving the

policy and institutional factors that constrain production, income, and employment generation in the rural sector. The emphasis on production technology frequently has kept the universities from having a voice and visibility in important decisionmaking arenas in the public and private sectors.

A few universities have made concerted efforts to involve their faculties and students in broader ranges of rural development issues. Through subcontracting arrangements with local governments, the Postgraduate College at Chapingo has assumed responsibility for the design, management, and replication of district rural development strategies and programs. Through this partnership with local governments, the university has acquired expertise and input into decisionmaking processes that involve larger questions of institutional and policy design. This has greatly enhanced its credibility and access to important centers of support and influence.

## LESSONS LEARNED

University development efforts should focus greater attention on issues of institutional sustainability in ensuring that the university has the capacity to constantly renew itself. Once the institution is built, attention must be focused on sustaining its long-term vitality. In particular, new strategies are needed for enhancing institutional learning so that the university can become more responsive to a changing environment.

University development efforts should emphasize the development of strong linkages with external constituencies and policy arenas. Such linkages with farmer groups, agro-industrial organizations, and other relevant public and private organizations provide the university with information and resources for improving and sustaining its education and research programs.

University research and education should address policy and institutional concerns as well as technological factors that contribute to rural and agricultural development. Improvements in agricultural production are closely linked with improvements in micro and macro institutional arrangements for input delivery, marketing, and pricing within the rural sector. Developing expertise in these areas can enable the university to exercise a greater leadership role in policy dialog.

Strategic planning concepts and methods should be used in university agenda setting, management, and linkage development. Many universities lack a coherent sense of mission and a clearly defined set of strategies for enhancing their contributions to development. As a consequence, they are finding it difficult to thwart academic drift and inertia. The application of strategic

planning tools can be a means for supporting university renewal and redirection.

Universities should pioneer innovative rural development strategies, particularly for complex problems in natural resource use, income growth, and poverty alleviation. A more activist and interdisciplinary approach to research and education in addressing these problems can contribute to university learning as well as produce prototype innovations for more widespread adoption.

Government agencies should expand their vision of the role of the university and serve as facilitators rather than regulators of university innovation. More autonomy from centralized controls is necessary to encourage a university's initiatives in building, sources of strong support and linkage with its environment.

The above lessons and others like them are summarized in a separate paper, entitled "Universities for Development: Lessons for Enhancing the Role of Agricultural Universities in Developing Countries," which is available on request from CDIE.

## OUTSTANDING ISSUES

### Faculty Development

The early generation of university scientists and leaders who received U.S. training under A.I.D. financing are now retiring. Funding for overseas training has dropped off in recent years, reducing the number of staff exposed to new ideas, the latest technological developments, and alternative ways of solving problems. Because the new generation of faculty lack international exposure, there is a concern that they will lack the experience and vision necessary for sustaining institutional excellence.

### Student Employment

In many countries the demand for undergraduate-degree holders in the public sector, the traditional source of most employment opportunities in the agricultural sciences, is in decline and there is little prospect for employment increases in the private sector. Many universities therefore will need to adapt their educational programs to new markets, including designing nondegree programs for specialized skill development.

### Strategic Planning

Many universities are becoming increasingly fragmented as departments organized around more specialized academic disciplines proliferate. University leaders are becoming concerned that in order to thwart incipient academic drift,

universities need to define a more consolidated research and education agenda. In particular, there is a need for tools in strategic planning and management in defining university programs from a larger interdisciplinary perspective.

#### International Networking

Many universities are falling behind state-of-the-art advances in science and education, in large part because they are increasingly isolated from worldwide centers of innovation. University leaders would like to become more involved in the development of learning networks that would link universities from developing and developed countries in the exchange of knowledge and the exploration of new ways of creating more dynamic university environments.

#### INTERNATIONAL CONFERENCE ON AGRICULTURAL HIGHER EDUCATION

The above issues constituted the main agenda for a recent international conference sponsored by A.I.D. The conference was held in Reston, Virginia, October 2 through 8, 1988, and featured university presidents and deans from 25 developing countries, directors of international agricultural programs from the U.S. land-grant universities, and representatives from the World Bank, the United Nations Food and Agriculture Organization, the Kellogg and Rockefeller Foundations, and A.I.D.

The major objective of the conference was to expose the participants to some of the most advanced concepts and practices in strategic planning for agricultural universities and faculties.

The emphasis was on using these concepts as fragmented as tools for addressing the issues identified above, and particularly on those that relate to achieving a more relevant and dynamic mission and role for the university in national development.

The level of enthusiasm was such that a number of participants from developing countries indicated their desire for help in applying the methodologies at their home universities. They also were interested in developing new modes of collaboration between developed- and developing-country universities in addressing larger issues of university revitalization.

The views and interpretations expressed herein are those of the author, Gary Hansen, and should not be attributed to the Agency for International Development. Any comments or inquiries should be sent to the Center for Development Information and Evaluation, Bureau for Program and Policy

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